

STAT 5511 Practice Initial (Pre-req) Quiz

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The following is practice material or a practice quiz for (my version of) STAT 5511. The material will generally be reviewed over the first few lectures (i.e., the first 2 or 3 lectures). It is based on the pre-requisites for the course. (Some questions involve basics of complex numbers which students should have learned at some point, but some students may not have used in a long time; again, this will be reviewed, but we will not linger on it.) The point of the quiz is to provide students with some information/guidance about the fit of the course (no course can effectively serve all students at once, unfortunately) so students can make informed decisions about whether or not to enroll.

In the course, a quiz of this type will be given early on (in the first week or so of the course), after having done the above-mentioned review.

Quiz Instructions:

1. Do not open this quiz until you are instructed to do so!
2. The quiz contains a total of:
 - 5 questions, and
 - 2 pages, including this cover sheet.

Once you are told to open your quiz, check that you have them all.

3. Show all work for full credit.
4. No outside materials, cheat sheet, nor calculator are allowed on this exam.
5. For numerical calculations, only a calculator-ready expression is required for full credit. You do not need to provide a numerical value or decimal approximation.
6. If you are caught cheating on this quiz, you will fail the course. Cheating includes aiding or abetting cheating.

1. Explain the difference between two variables being independent as opposed to having correlation of 0.
2. Let $W_1, W_2, W_3, W_4 \stackrel{\text{iid}}{\sim} (0, 1)$ (i.e., having mean 0 and variance 1). Let $X = W_1 + 2W_2 + 3W_3$ and $Y = W_2 + 2W_3 + 3W_4$. Find $\text{Cov}(X, Y)$.
3. Let $r \in (0, 1)$. The geometric(r) distribution has probability mass function $p(y) = r(1 - r)^{y-1}$ for $y = 1, 2, 3, \dots$ (and $p(y)$ is 0 otherwise). Show that this probability mass function defines a “bona fide distribution”, meaning show that if you sum over the entire sample space, you get 1.
4. (a) Show $(1/2)e^{i\pi/2} = i/2$.
(b) Write $1/i$ in $a + bi$ form.
5. Consider the polynomial $P(z) := -z^2 + z + 3$.
 - (a) How many roots (zeros, solutions) does this polynomial have?
 - (b) Find all of the roots.